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(60) **References to other national published documents:**

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(54) CONNECTION INTERFACE BETWEEN CHIP-CARD READERS AND CONNECTION SYSTEM BETWEEN READERS CONTAINING SUCH AN INTERFACE

The invention concerns a connection interface (I) between at least two readers for contact chip cards, characterized in that it includes means of connection (CxCP) to a chip-card micromodule (CP), means of connection (CxA, CxB) to said readers, and a switch (C) capable of establishing alternatively a connection between said chip-card micromodule (CP) and one of the readers then between said card micromodule (CP) and another reader.

(57) [diagram]

CONNECTION INTERFACE BETWEEN CHIP-CARD READERS AND CONNECTION SYSTEM BETWEEN READERS CONTAINING SUCH AN INTERFACE

The invention concerns a connection interface between at least two chip-card readers.

It also concerns a connection system including such an interface and at least two readers. The field of the invention is that of systems permitting a chip card to be connected to readers for contact chip cards.

The invention applies, in particular, to systems for testing readers, i.e., testing terminals communicating with a chip card. As examples of such terminals can be mentioned ticket distributors or even payment terminals, especially those that are currently presented by merchants at the time of payment by bank card.

These tests currently include about 300 steps, which constitute a battery of tests.

Among these test system, a simulator represented in Figure 1 is known, which includes a probe Sde connected to a device D, which is in turn connected to a computer PC. When the probe Sde is inserted partially into the terminal A to be tested, this simulator permits the battery of tests residing in the PC to be executed. But this system is costly and non-portable, and it can be used only to test terminals in which the chip card is inserted completely, such as ticket distributors.

Another solution, shown in Figure 2, consists of using a test card: this involves a chip card CP that is personalized by a reader B connected to a computer PC in which the battery of tests resides.

It will be recalled that a chip card includes a microcircuit that includes essentially an input/output interface, a microprocessor, a memory for an operating program, for example a ROM ("Read Only Memory"), an application memory, for example an EEPROM ("Electrically Erasable Programmable Read Only Memory"), designating a

dead memory programmable by the computer and electrically erasable), and a working memory, for example a RAM ("Random Access Memory"), designating a live, volatile memory.

The input/output interface, in the case of contact chip cards, is realized by an asynchronous receiving or transmitting unit and a connector including eight contact areas C1-C8 appearing on the surface of the card. Each of these contacts is assigned to a specific signal: C1 to the supply-voltage signal, denoted by Vcc, C2 to the reset-to-zero signal, denoted by RST, C3 to the clock signal, denoted by CLK, C5 to the electric ground, denoted by GND, C6 to the programming
voltage, denoted by Vpp, C7 to the series of data inputs/outputs, with C4 and C8 being reserved for future needs.

In order for a battery of tests to be transferred from the reader B to the chip card CP, the card CP is inserted into the reader B. The connection to the reader B is established by the contacts, and the transfer of data is effected through the input/output contact (C7).

Once it has been personalized, the card CP is inserted manually into the terminal A, in order to subject terminal A to the test. The connection is established as described for the reader B.

But the card CP does not contain the whole battery of tests, because, in particular, of the insufficient size of its memory. It could, however, contain, for example, about ten tests, but in this case, if the terminal rejects the card on the first of these ten tests, it does not know whether the following tests are good. For this reason, in practice, it is preferable to separate the tests. It is therefore necessary to perform numerous manipulations, about 300, each manipulation consisting of personalizing the card CP with one of the tests of the battery of tests, then inserting the card CP manually

into the terminal A for testing. This solution is economical and permits the portability of the test card CP to be exploited, but it requires numerous manipulations.

The purpose of the invention is to propose an economical solution that does not require all these manipulations.

The invention has as its object a connection interface between at least two contact chip-card readers, characterized principally in that it includes means of connection to a chip-card micromodule, means of connection to said readers, and a switch capable of establishing in alternation a connection between said chip-card micromodule and one of the readers, then between said card micromodule and the other reader.

According to one characteristic of the invention, the means of connection to the readers each include a connector provided with contact areas on the surface, arranged on the interface so as to permit partial insertion of the interface into the chip-card reading slot of the readers.

According to one embodiment of the invention, the functional elements of one of the readers are integrated into the interface.

The chip-card micromodule can also be integrated into the interface. It can itself be a chip card.

The chip card can be fixed in the interface, or the interface can include an insertion slot for a chip card inserted into said slot.

According to another characteristic of the invention, one of the readers is cable of controlling the switch.

More particularly, the means of connection consisting of contacts, each assigned to a specific
signal; the switching command is realized by one of these specific signals.

This specific signal can be a supply-voltage signal or even a reset-to-zero signal.

The invention also has as an object a connection system including an interface such as described previously, and at least two readers, characterized in that one of the readers includes an application program including sub-programs capable of being transferred to the chip-card micromodule during execution on the other reader.

According another characteristic, the switch command is realized by the application.

Other features and advantages of the invention will appear clearly on reading the description, which is given as a non-limiting example, and with reference to the attached diagrams, in which:

- Figure 1 shows a simulator of tests of chip-card readers according to prior art,
- Figure 2 describes another the use of a test card to perform the tests on readers according to prior art,
- Figure 3 presents the principle of the interface according to the invention,
- Figure 4a shows the connections between the switch and the means of connection to the terminal, the reader, and the chip card,
- Figure 4b shows the two states of connection to the interface,
- Figure 5 shows schematically the change from one state to the other,
- Figures 6 a), 6 b), and 6 c) represent three embodiment examples of the invention.

The interface I according to the invention shown in Figure 3 is connected to a reader B and to a terminal A; it permits, on the one hand, the chip card CP, to which it is also connected, to be connected to a reader B used to personalize the card CP as a test card. This reader B is, in fact, connected to a computer PC, in which the test battery resides. Different readers could be used later to personalize the card CP.

The interface I permits, on the other hand, the test card CP to be connected to the terminal A for testing.

As the test card CP is in a relationship with the two readers, it is provided with a device that permits short-circuits to be avoided: in fact, the signals used for chip cards (the supply-voltage signal Vcc, the ground GND, the reset-to-zero RST, the clock signal CLK, the programming voltage Vpp, and the serial data inputs/outputs IO, can be activated only by the reader B when the terminal A transmits them.

For this purpose, the interface I includes a switch C, means of connection CxB to the reader B and CxA to the terminal A, and a location E intended to receive the chip card CP, this location E being provided with means of connection CxCP to the chip card CP. These means of connection CxA, CxB, and CxCP can take the form of a connector including eight contact areas as described above. These means of connection are connected to each other by means of the switch C, as described in Figure 4a.

In operating mode, the interface I is connected to the chip card CP, the reader B, and the terminal A, but only two states are authorized for the switch C.

At a first time, the switch C is in state 1, shown in Figure 4b, that is, the state establishing a connection between the card CP and the reader B; the card CP and the terminal A are no longer connected. The reader B can then personalize the card CP with a test from the battery of tests.

When the personalization is finished, the switch C then enters state 2, that is, the state establishing the connection between the card CP and the terminal A; the card CP and the reader B are no longer connected. The personalized card CP can then proceed with the corresponding testing of terminal A.

When this test is finished, the switch enters state 1 to personalize the card CP with the next step, and so forth until the entire battery of tests has been performed.

The switching of the switch from one state to another can be effected by several methods.

Switching from one state to another can be activated by one of the signals cited previously, in particular, signal Vcc: in fact, this signals goes to 5 V at the start of the transaction and falls back to 0 V at the end of the transaction. By "transaction" is meant personalizing the card PC or testing the terminal A. The switch can thus be controlled by this signal according to the diagram shown in Figure 5.

When the level of signal Vcc from reader B goes from 5 V to 0 V, the switch changes from state 1 for personalizing the card CP to state 2 for testing the terminal A. Likewise, when the level of signal Vcc of terminal A goes from 5 to 0 V, the switch changes from state 2, testing the terminal A, to state 1, personalizing the card CP.

It can also be provided that the switch C systematically changes into state 1 when signal RST is active.

The change can also be activated by other signals than the signals cited previously. In fact, since contacts C4 and C8 are not generally used for chip cards, new signals can be envisioned and assigned to these contacts C4 and C8, using one to control the change of the switch from one state to the other.

The change can also be provided by the test program. Each personalization step for the card CP will include an instruction at the end of the personalization consisting of changing the card CP to state 2, testing the terminal A, to state 1, personalizing the card CP.

Other methods can be envisioned.

Three embodiments of the invention will now be described.

According to the first embodiment, shown in Figure 6a, the interface I is independent of the terminal A, the reader B, and the chip card CP. Before the battery of

tests is started, the interface I, into which the card CP is inserted partially or completely, is inserted partially into the reader B and partially inserted into the terminal A. The battery of tests can then be started and continued as described previously.

In a second embodiment, the functional elements of the reader B are integrated into the interface I. "Functional elements of the reader B" designates the set of material and program elements that permit it to function, that is, the reader without its box. Before starting the battery of tests, it is sufficient to insert the interface I partially into the terminal A without inserting the card CP partially or completely.

In the case where the terminal A to be tested operates with complete insertion of the card CP, as for example ticket distributors, the interface I cannot be used, but its configuration permits the chip card CP to be used alone according to the procedure of Figure 2, which requires manual manipulations. These two first embodiments have great adaptability to the various situations of terminals to be tested.

According to the third embodiment, presented in Figure 6c, the chip card CP is integrated into the interface I as well as the reader B. The chip card CP can be replaced by its micromodule or by a card the size of the micromodule, the contact areas of said micromodule being in contact with the connections CxCP of the interface I. Before starting the battery of tests, it is sufficient to insert the interface part I into the terminal A. This solution is the most compact of the three.

In all cases of Figure 1, the interface I includes means of connection CxCP to a micromodule, which either stands alone or is integrated into a support card. The card can be fixed in the interface I, as has been seen, or immovably in a classic reader.

CLAIMS

1. A connection interface (I) between at least two contact chip-card readers, characterized in that it includes means of connection (CxCP) to a chip-card micromodule (CP), means of connection (CxA, CxB) to said readers, and a switch (C) capable of establishing in alternation a connection between said chip-card micromodule (CP) and one of the readers, then between said card micromodule (CP) and another reader.

2. An interface (I) according to the preceding claim, characterized in that the means of connection (CxA, CxB) to the readers each includes a switch provided with contact areas appearing on the surface of the interface (I), so as to permit partial insertion of the interface (I) into the reading slot for chip-card readers.

3. An interface (I) according to one of the preceding claims, characterized in that the functional elements of one of the readers are integrated into the interface (I).

4. An interface according to one of the preceding claims, characterized by the fact that the chip-card micromodule (CP) is integrated into the interface (1).

5. An interface (I) according to one of claims 1 through 3, characterized by the fact that the chip-card micromodule is in a chip card.

6. An interface (I) according to the preceding claims, characterized in that the chip card is fixed in the interface (I).

7. An interface (I) according to claim 5, characterized by the fact that the interface (I) includes an insertion slot for a chip card and that the chip card can be inserted into said slot.

8. An interface (I) according to one of the preceding claims, characterized in that one of the readers is capable of controlling the switch (C).

9. An interface (I) according to one of the preceding claims, the means of connection consisting of contacts, each assigned to a specific signal, characterized in that control of the switch (C) is realized by one of these specific signals.

10. An interface (I) according to the preceding claim, characterized in that the specific signal is a supply-voltage signal.

11. An interface (I) according to claim 9, characterized by the fact that the specific signal is a reset-to-zero signal.

12. A connection system including an interface (I) according to one of the preceding claims and at least two readers, characterized in that one of the readers includes an application program including sub-programs capable of being transferred to the chip-card micromodule (CP) as it is being executed on the other reader.

13. A connection system according to the preceding claim, characterized in that the application is a test application on the other reader.

14. A system according to one of claims 12 or 13, characterized in that control of the switch (C) is realized by the application.

[diagram]

Fig. 1

[diagram]

Fig. 2

[diagram]

Fig. 3

[diagram]

Fig. 4a

[diagram; "Etat" = "State"]

Fig. 4b

Level Vcc of A
high to low
[diagram; "Etat" = State"]
Level Vcc of B
high to low

Fig. 5

[diagram]

Fig 6a

[diagram]

Fig. 6b

[diagram]

Fig. 6c

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PRELIMINARY SEARCH REPORT

National Registration Number

Established on the basis of the last claims filed before search was started **FA 588520** **FR 0005251**

Relevant Documents

Category	Identification of Documents with specification, where required of critical parts	Re Claim	Classification assigned to invention by INPI
A	US 5 629 508 A (DIXON ROBERT ET AL) 13 May 1997 (1997-05-13) * the entire document *	1-14	G06fF 3/06 G06F 11/00 G06K 19/07 G06K 7/00
A	EP 0 706 291 A (NEWS DATACOM LTD) 10 April 1996 (1996-04-10) * the entire document *	1	
A	DE 197 19 275 A (DETHLOFF JUERGEN) 12 November 1998 (1998-11-12) * the entire document *	1	

Searched Fields (Int. Cl. 7)

G06K

Search completed	Examiner
6 February 2001	Degraeve, A

Category of cited documents

A background technology